VI.—*Mechanism of Movement in Cucurbita, Vitis and Robinia.*

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The valuable contributions of Darwin[1] to our knowledge of the movements of plants, about ten years since, led to an examination of this most interesting question, and eventually, to the particular form of it to be discussed in the present paper. At that time, the idea of the individuality of the cell prevailed, although Sachs had already demonstrated the continuity of protoplasm through the sieve plates of Cucurbita[2] and had formulated an expression in which he indicated a strong belief in the continuity of all living cells. It is only within very recent years, however, that sufficient reason has been given for a general change of opinion on this question. The additional light which has of late been thrown upon our knowledge of the cell, in its mutual relations, has presented many new and important subjects for consideration with reference to the physiology of movement in plants.

In the motile organs of plants—as represented by those now under consideration—we have to deal with organs which on the one hand are modified as a whole, with reference to their external form, and are thus adapted to a particular purpose, as in Cucurbita and Vitis; or which, on the other hand, show these modifications to be strictly localized, as in the pulvinus of Robinia. In each case, moreover, the internal structure is usually modified in an important way, and to a striking degree. In the tendrils of Cucurbita and Vitis, this occurs in the excessive thickening of the hypodermal tissue, which becomes almost entirely collenchymatous; in the localized development of active fundamental tissue lying in the outer hypodermis; and in the excessive formation of some vascular element—usually bast—which thereby produces a more or less continuous zone or vascular cylinder, internal to the softer parts of more active growth. In the pulvinus of the Robinia, the modification is chiefly found in the excessive hypertrophy of the hypodermal tissues, either at the base of the petiole, or throughout the entire length of the petiolule. In all of these cases, the true relative positions of the tissues, as found in the unmodified organ, e. g. stem or petiole, are fully maintained, but the special change developed in each of the component tissues causes an unusual relation to be established between them, so far as their mutual tension is concerned. This at once introduces an important factor in the conditions of equilibrium which would otherwise be maintained, with the result that some disturbance of this condition must sooner or later occur, and this disturbance then becomes outwardly manifest in the form of motion.

Since variations of this character can occur in living tissues only, they must be

[1] Journal Linnean Soc., Vol. ix, 1865. [2] Text-book, p. 89.